# SPACE MISSIONS

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| Year | Mission | Payload(s) | Launch Vehicle | Purpose | Status | Special Specification |
|---|---|---|---|---|---|---|
| **1975** | Aryabhata | Experimental satellite | Kosmos-3M (USSR) | India's first satellite, tech demonstration | Success | First Indian satellite. |
| **1980** | Rohini (RS-1) | Earth observation | SLV-3 | First indigenous satellite launch | Success | Debut of India's first satellite launch vehicle, SLV-3. |
| **1983** | INSAT-1B | Communication | Delta 3910 (USA) | Telecom, broadcast, meteorology | Success | Part of the Indian National Satellite (INSAT) System. |
| **1987** | SROSS | Scientific research | SLV/ASLV | Research & observation satellites | Mixed | Part of the SROSS series of satellites. |
| **1999** | INSAT-2E | Communication | Ariane-4 (France) | Advanced telecom & broadcast | Success | Improved payload capacity. |
| **2008** | Chandrayaan-1 | Orbiter, international payloads | PSLV-C11 | Lunar orbiter, discovered **water molecules on the Moon**. | Partial | Included payloads from **NASA, ESA, JAXA, and Bulgaria.** |
| **2011** | Megha-Tropiques | Joint satellite (France) | PSLV-C18 | Tropical weather studies. | Success | Indo-French collaboration. |
| **2013** | Mars Orbiter Mission (MOM) | Mars orbiter | PSLV-C25 | Mars atmosphere study, technology demonstration. | Success | **First Asian Mars orbiter** and first to reach Mars on the maiden attempt. |
| **2015** | Astrosat | Multi-wavelength telescope | PSLV-C30 | Astronomy, space observation | Success | First Indian space telescope. |
| **2019** | Chandrayaan-2 | Lander, rover, orbiter | **GSLV Mk III-M1** | Lunar **south pole exploration** | Partial | The orbiter is successful, but the lander/rover failed to soft-land. |
| **2021** | Amazonia-1 | Brazilian satellite + co-payloads | PSLV-C51 | Earth observation, collaboration with Brazil. | Success | First dedicated commercial mission for NSIL. |
| **2022** | OneWeb India-1 | 36 Communication satellites | LVM3 | Broadband satellite launch, UK collaboration. | Success | Commercial mega-constellation launch. |
| **2023** | Aditya-L1 | Solar observatory | PSLV-C57 | Sun/solar studies from Lagrange Point 1. | Success | **India's first solar mission**. |
| **2023** | Chandrayaan-3 | Lander, rover | **LVM3 M4** | Demonstrate lunar landing technology. | Success | First country to land on the Moon's **South Pole**. |
| **2023** | DS-SAR | DS-SAR + 6 co-passengers | PSLV-C56 | Dedicated commercial mission for Singapore, earth observation. | Success | Carried a Synthetic Aperture Radar (**SAR**) payload. |
| **2024** | XPoSat | X-ray Polarimeter Satellite | PSLV-C58 | Cosmic X-ray polarization research. | Success | India's first dedicated polarimetry mission. |
| **2024** | RLV LEX-02 | Reusable Launch Vehicle | N/A (tested from helicopter) | Autonomous landing demonstration of a reusable vehicle. | Success | Key step for a future low-cost reusable launch vehicle. |
| **2024** | SpADEx | Space Docking Experiment | PSLV-C60 | Demonstrate in-space rendezvous and docking. | Success | A crucial technology test for the Bharatiya Antariksha Station. |
| **2024** | Proba-3 | Two satellites for formation flying | PSLV-C59 | Joint mission with **ESA** to test precision formation flying and study the **Sun's corona.** | Success | **World's first precision formation-flying mission**. |
| **2024** | INSAT-3DS | Advanced weather satellite | **GSLV-F14** | For meteorological services. | Success | - |
| **2025** | Gaganyaan-1 | Uncrewed crew module, **Vyommitra** | LVM3 (GSLV Mk III) | First uncrewed test flight for India's human spaceflight program. | Planned | Will carry a ***female humanoid robot*** to test systems. |
| **2025** | NISAR | **Dual-band SAR (joint NASA/ISRO**) | **GSLV** | Earth remote sensing. | Success | Dual-band, Indo-US joint mission. |
| **2025** | NVS-02 | Navigation satellite | **GSLV-F15** | Part of India's NavIC navigation system. | Success | Second-generation navigation satellite. |
| **2026** | Gaganyaan (Crewed Mission) | Human spaceflight crew module | LVM3 (GSLV Mk III) | India's first human spaceflight mission to LEO. | Planned | Will make India the fourth country to independently launch humans into space. |
| **2026** | LUPEX | Rover (with **JAXA**) | **GSLV/PSLV** | Lunar South Pole study, water detection. | Upcoming | Indo-Japanese collaboration. |
| **2027** | Chandrayaan-4 | Lunar lander, sample return | **GSLV Mk III** | First lunar **sample-return** mission. | Proposed | A highly complex mission to retrieve lunar soil and rocks. |
| **2027** | Mars Orbiter Mission-2 | Mars orbiter | PSLV/GSLV | Advanced Martian atmosphere and surface study. | Upcoming | Follow-up interplanetary mission with more advanced instruments. |
| **2028** | Shukrayaan (Venus Mission) | Venus orbiter | **GSLV** | Venus atmosphere and surface study. | Upcoming | India's first mission to Venus. |
| **2035** | Bharatiya Antariksha Station | Indian space station | TBD | Permanent manned facility for research in low-Earth orbit. | Proposed | India's own space station. |

| Feature | Polar Satellite Launch Vehicle (PSLV) | Geosynchronous Satellite Launch Vehicle (GSLV) | LVM3 (formerly GSLV Mk III) | Small Satellite Launch Vehicle (SSLV) |
|---|---|---|---|---|
| **Primary Purpose** | Launching remote sensing, Earth observation, and scientific satellites into Low Earth Orbits (LEO) and Polar Sun-Synchronous Orbits (SSO). | Launching heavier communication satellites into Geosynchronous Transfer Orbit (GTO). | Launching the heaviest communication satellites into GTO and heavier payloads into LEO. Human-rated for crewed missions. | Launching small satellites (mini, micro, nano) into LEO on demand. |
| **Payload Capacit y** | **To SSO (600 km):** Up to 1,750 kg. **To GTO:** 1,425 kg. | **To GTO:** 2,250 kg (Mk II). **To LEO:** Up to 6,000 kg. | **To GTO:** 4,000 kg. **To LEO:** Up to 8,000 kg.<br><br>Human-rated version for Gaganyaan mission. | **To LEO (500 km):** Up to 500 kg. **To SSO (500 km):** Up to 300 kg. |
| **Stages & Propulsion** | **Four** stages. Alternates between solid and liquid propulsion systems. | **Three stages** (solid, liquid, and cryogenic). Uses solid boosters and liquid strap-ons. | **Three stages**: two solid strap-on boosters, one liquid core stage, and a cryogenic upper stage. | Three solid propulsion stages and a liquid propulsion-based Velocity Trimming Module (VTM). |
| **Key Features** | Known as the **"Workhorse of ISRO"** due to its reliability and versatility. Can be configured with 0, 2, 4, or 6 strap-on boosters. | Uses indigenous cryogenic engine in the upper stage (GSLV Mk II). Can launch heavier payloads than PSLV. | India's most powerful and advanced launch vehicle. The human-rated version will be used for the Gaganyaan mission. | Designed for low cost, quick turnaround time, and minimal launch infrastructure. Aims for "launch on demand" capability. |
| **Variants** | **PSLV-CA:** (Core Alone) no strap-ons. **PSLV-DL:** 2 strap-ons. **PSLV-QL:** 4 strap-ons. **PSLV-XL:** 6 strap-ons. | **GSLV Mk I:** Used ***Russian*** cryogenic stage. **GSLV Mk II:** Uses **indigenous** cryogenic engine. | LVM3 (renamed from GSLV Mk III) is a separate class of launch vehicle. | SSLV has a three-stage configuration with a VTM for precise satellite injection. |